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China Report

SCIENCE AND TECHNOLOGY

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CHINA REPORT

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ABSTRACTS

NATIONAL DEVELOPMENTS

DEYANG SEEN AS DEVELOPING NEW INDUSTRIAL CITY

Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 7, 7 Jul 85 p 13

[Article by Jiang Daojian [5592 6670 1696]

[Text] Deyang, lying on the northern edge of the Chengdu plain in Sichuan province, is 70 km north of Chengdu and includes the Deyang, Zhongjiang, Guanghan, Mianzhu and Shifang counties. Its total area is 6,048 square kilometers and it has a population of 3.56 million people, 160,000 of them are workers. One of the six municipalities under the direct jurisdiction of the Sichuan provincial government, Deyang was incorporated in August 1983. The municipal People's government is located in Wuzhen (Jingyang), the original county seat of Deyang with a population of about 100,000.

Based on its topographical features, Deyang can be roughly divided into three sections. East of the Longquan mountain is a hilly region characterized by its square mounds and purple soil. This area covers the whole Zhongjiang county and parts of the Deyang and Guanghan counties. The economy is mainly agricultural, and many agricultural by-products are produced here. Lying between the Longquan and Jiuding mountains and slightly tilting from northwest to southeast, the central section is an alluvial plain formed by the Mianyuan and Shiting rivers, the two tributaries of the Tuo river. Being part of the Chengdu plain, this is the most prosperous area of the city where the majority of the city's industries are located. Its agriculture is consisted mainly of staple crops and aquacultures. The western section is the Jiuding mountain region with elevations ranging from 1,000 to 2,000 meters. There are abundant mineral resources such as phosphates, limestones, coals and marbles, and forest covers wide areas.

Before the Liberation, the industrial base of Deyang was rather poor as basically the area was purely agricultural. After the Liberation, a large-scale construction project was carried out here that enhanced the rapid development of industries and brought about changes to the city with each passing day. In 1958, Comrade Deng Xiaoping pointed out that "Deyang's industries are very important to the state. Take for example the manufacturing plants for metallurgical and power station equipment, they are the largest in the nation and the foundation of the machine-building industry. It will become a new industrial city." After 30 years of arduous constructions, today's Deyang has evolved into a new city based primarily on machine-building industry with such supplemental industries as construction material, chemical, food and textile.

The machine-building industry is Deyang's industrial base. There are large state-run key enterprises such as the No 2 Heavy Machinery Plant, the Dongfang Gas Turbine Plant, and the Dongfang Electrical Machinery Plant. There are also scores of small and medium-sized machinery plants manufacturing mining machines as well as bearing, food, chemical and petroleum machineries. Half of the fixed assets of the city's enterprises belongs to the machine-building enterprises, 66 percent of whose employees are engineers. They also possess many first-class facilities. Many products are among the best in the country and some are the best in the world. For example, the 175,000 kW generator installed in the Gezhou Dam hydropower station, the axle of the 60,000 kW generator, the 10,000 ton multi-directional, die-forged hydraulic press, and the 320,000 kW generator installed at the Longyang Gorge power station are all first-rate products. At present, this area is the most important base in the country for the manufacture of heavy machineries and power generation equipment.

In the 1960's, abundant phosphate ores were found in the Jiuding mountain and thus the emergence of Deyang's phosphorus-based chemical industry. The current annual phosphate rock output of the city reaches 1.2 million tons. During the Seventh 5-year Plan period, key constructions will be carried out by the state at the Zingping Phosphate Mine with the projected annual output of 1.5 million tons. Another large mine, the Jinhe Phosphate Mine, will also be expanded. The establishment in Deyang of a phosphorus-based chemical industry base is currently at the planning stage. The construction material industry is also an industry that Deyang has an advantage on. The limestone deposit reaches several billion tons and the deposit of sandstone is also quite remarkable. However, they are far under-utilized and are awaiting further exploitation. A large deposit of marble has recently been found. Besides, the city's coals and pyrites have already been mined.

The light industries of Deyang, particularly the food industry, are also nationally renowned. The Jiannanchun Distillery at Mianzhu is the producer of the "Jiannanchun" liquor that twice won the national gold medal. The "Tianlu" peanuts, Shifang cigarettes, and Guanghan's Chansi rabbits all have rather big international and domestic market. Raw silk is a traditional export item. Because Deyang has a well-developed agriculture, there is tremendous potential in the food and silk industry.

Besides the rapid development of industries, Deyang also has an extensive transportation network. The Baocheng railroad and Chuanshan highway pass across the city and the De(yang)-Tian(chi) railroad connects the city to another important industrial area, Hanwang. The Guang(han)-Yue(jiashan) railroad connects the Jinhe Phosphate Mine and Shifang to the outside. Highways radiate in all directions. The main arteries includes the Shimian, Detian and Guangmu highways and there are large number of branches. Furthermore, there is a fair-sized civilian airport, the Guanghan Airport. With the development of economy, the existing roads can no longer satisfy the needs. Therefore, the restructuring of the Deyang-Chengdu section of the Chuanshan highway has been put on the agenda. The transportation of Deyang will take on a new appearance.

Deyang has a sound industrial base, abundant resources and agricultural by-products, and an extensive transportation network, so it is in a very good position for its economy to take off. Based on the current economic development, the city party committee has proposed the goal of quadrupling output in 5 years. So far, over 100 items of economic and technological cooperation have been signed with 14 provinces including Gansu, Liaoning and Hebei to help exploit the rich resources in the area. The economic development of Deyang will play a positive and significant role in the development of our rich mineral and water resources, in the development of the economy in the southwest and especially in the development of the economy of the province.

12922
CSO: 4008/405

NATIONAL DEVELOPMENTS

NUMBER OF PRC STUDENTS STUDYING ABROAD DETAILED

Beijing BANYUETAN [SEMI-MONTHLY TALKS] in Chinese 25 Aug 85 p 39

[Article by Li Xue [2621 7185]: "How Many PRC Students Are Studying Abroad?"]

[Text] Sending students abroad to study is one way to train talented personnel and is also an important component of opening up to the outside world. With science and technology developing day by day, all countries are extremely interested in sending students abroad to study.

Since 1978, there has been considerable development in China's work of sending foreign students abroad. Up to the present time, the state has already sent more than 29,000 students abroad, while more than 7,800 students have paid their own way to study abroad; this adds up to more than 36,800 foreign students. These students are scattered throughout 36 countries and regions. More than 15,000 students have already completed their studies and returned to China.

Of those students that the state has assigned to study abroad, 78 percent are personnel engaged in advanced studies, 17.9 percent are graduate students, and approximately 4.1 percent are undergraduates. With regard to academic specialty, about 28 percent are studying sciences, approximately 39.6 percent are engineering students, about 7.7 percent are studying agriculture, 11.1 percent are studying medicine and approximately 13.1 percent are studying liberal arts.

Not only is the number of PRC students studying abroad in the past 6 years more than twice the number of students who studied abroad between 1950 and 1977, but there have also been numerous new developments in the composition of personnel, the regions to which they have been sent, the specialized fields of study and the channels of assignment.

CSO: 4008/2005

NATIONAL DEVELOPMENTS

IMPORTED S&T USED TO PRODUCE PRECISION INSTRUMENTS

OW251802 Beijing XINHUA in English 1610 GMT 25 Sep 85

[Text] Beijing, 25 Sep (XINHUA)--Chinese scientists have succeeded in constructing two kinds of large precision scientific instruments--an electron scanner microscope and an organic mass spectrometer, with imported technology.

The instruments were passed at an appraisal meeting here today, which was organized by the State Science and Technology Commission and the Chinese Academy of Sciences.

Production technology for these instruments was provided by Amray Inc. of the United States and VG Company of Britain.

Experts said that the technical standards of the instruments are up to the requirements set by the contracts.

The electron microscope, a new generation of its type, has a higher resolution power for analyzing the element composition of samples.

The mass spectrometer is an analyzer integrating chromatography, spectrometry and computer technology, and is widely used in the fields of organic chemistry, biochemistry, geochemistry, medicine and hygiene, food chemistry and environmental protection.

An official from the State Science and Technology Commission said that production of the two instruments marked the transition from equipment import to technology import for China in the scientific field.

Meanwhile, it was disclosed that China Oriental Scientific Instrument Import and Export Corporation and Amray Inc. are discussing cooperative production of another type of electron scanner microscope.

A signing ceremony to approve the first batch of such instruments was held here this evening.

CSO: 4010/2001

JILIN'S SECRETARY SPEAKS AT SCIENCE CONFERENCE

[Excerpts of speech by Gao Di, secretary of Jilin Provincial CPC Committee, at the 7 September 1985 provincial science and technology conference]

[Text] Comrades:

This provincial scientific and technological work conference is very important. By implementing guidelines of this conference, a new situation is bound to appear in the province's reform of the scientific and technological structure, and still more vigorous development in economic construction will certainly be promoted.

I will now give four opinions on implementing the guidelines of this conference and on ways to carry out scientific and technological reforms successfully.

1. On the Issue of Understanding

The most fundamental task of socialism is to develop social productive forces. Science and technology are the key to accomplishing the four modernizations. This principle is being understood by more and more comrades who have begun to pay attention to scientific and technological work. Generally speaking, however, the issue of understanding science and technology is far from being resolved, or is not thoroughly resolved. To some comrades, science and technology do not hold a place in their minds. They "consider them important when speaking about them, put them in a secondary position when carrying them out, and forget them when they are busy." Some leading comrades still regard science and technology as a "flexible task," thinking that they are "distant waters that cannot quench the present thirst." A few comrades have not fundamentally corrected the idea of looking down upon knowledge, talented people, and intellectuals. For this reason, the task of prime importance in carrying out scientific and technological reform and promoting their progress is still to solve the problems in understanding and to eliminate ideological obstacles.

Science and technology are [illegible]. This is a Marxist view. Following the development of science and technology and the progress of society, science and technology, under the varied factors promoting the development of productive forces, play an increasingly greater role. In particular, [illegible] new worldwide technological revolution which both science and technology permeate the various spheres of the people's material and spiritual lives more and more with each passing day and which have fully come their role in leading and promoting economic development. Comrades, in a word, we must not shut our eyes, close our ears, resist our world, or lose the golden opportunity. Anyone who understands this and starts his work earlier will gain the initiative and benefit earlier. Anyone who understands this and starts his work later will lose the initiative and benefit later. Anyone who does not understand this at all will be in danger of being eliminated.

As has been proved by [illegible] the decisive or essential overtake the level of productive forces and national wealth is by and large scientific and technological progress. In agriculture, electrical breeding and large-area [illegible] of such new technologies as "[illegible]" and "[illegible]" have played a decisive role in continuous good grain harvests in our province. In industry, Guangdong City's [illegible] is a new [illegible] developed in the early 1980's. Over the past few years, as [illegible] has advanced with positive results in [illegible] and abroad, through [illegible], [illegible] [illegible] has advanced with positive results in [illegible] international markets. It has been able to move [illegible] to the [illegible] Hong Kong region, and [illegible] to [illegible] at home and abroad, and its [illegible] of demand. It created more than 10 million yuan in output value this year. [illegible] we should [illegible] in order to enhance [illegible] "relying on science and technology [illegible]" as set forth by the CPC Central Committee. The [illegible] of our province are very abundant, but we do not have [illegible] to develop them. In fact, however, it will [illegible] scientific and technological work and [illegible] scientific and technological [illegible].

The [illegible] of science and technology [illegible] a long-standing, big, and difficult [illegible]. This problem has become more conspicuous following the development of [illegible] modernization. To solve this problem once and for all [illegible] important strategic issue in economic [illegible]. [illegible] Comrade Deng Xiaoping pointed out: "The [illegible] reside in the [illegible] of the combination of science and technology with the economy." By [illegible], we mean that after solving problems in policies and understanding, we

should continue to solve problems in practice." There are many stumbling blocks in the current scientific and technological structure: Insufficient connection and dislocation of science and technology with production; dispersion, and plenty of duplication and waste of manpower and material resources; barriers between different departments and regions; too much reliance on the state and a lack of impetus and vigor for self-development; and so forth. Such numerous drawbacks are detrimental to gearing scientific and technological work towards economic construction, to turning scientific and technological achievements into productive forces rapidly, and to the performance of the wisdom and creative ability of scientific and technical personnel. Without radical reform, it will be very difficult to enable scientific and technological work to act according to the natural law and the law governing the social economy, and effectively serve the four modernizations.

Comrade Deng Xiaoping pointed out: "The new economic structure should be one conducive to technological progress. The new scientific and technological structure should be one conducive to technological progress. The new scientific and technological structure should be one conducive to economic development. If we intend to place the experts, it is possible that the long-existing illness of science and technology from the economy will be resolved fairly successfully." This indicates an orientation for us to solve the problem of the divorce of science and technology from the economy. In order to solve this problem, the CPC Central Committee successively made a decision on reform of the economic structure, a decision on reform of the scientific and technological structure, and a decision on reform of the educational structure, providing a guiding principle and drawing a blueprint for us to carry out economic, scientific and technological, and educational reforms. Reform in these three fields are coordinated reforms. Economic reform is the center and scientific and technological and educational reforms are its two wings. They both sustain and promote each other, and should be carried out consecutively and successfully. At present, the economic reform has taken an encouraging step and achieved a good beginning, and is developing thoroughly and soundly. With regard to the educational reform, a meeting was just held which worked out overall plans. The meeting we are holding now conducts an overall study for the province's scientific and technological reform and makes overall plans for them. This enables our reforms to develop in an all-round and coordinated manner.

Reform is China's second revolution and an unprecedented undertaking for building socialism with Chinese characteristics are placed. We should vigorously carry out reform with a firm attitude and prudent steps and methods, and carefully design, work, and give guidance for it to make sure that our reform is in an desirable position.

3. On the Issue of Policies

Reform is an important job concerning policies, and the key to successfully making reform lies in correct policies. We should pay great attention to the issue of policies in the course of reform.

We should conscientiously study the principles and policies of the central authorities on the reform of the scientific and technological structure. Since the smashing of the gang of four, and particularly since the 3d Plenary Session of the 11th CPC Central Committee, the central authorities have formulated a series of principles and policies for scientific and technological work. In 1978, Comrade Deng Xiaoping penetratingly expounded on the thesis that "science and technology are productive forces" and that "intellectuals are an important component of the working class," at the National Science Conference. Such a thesis has laid down two principles and policies and a theoretical foundation for the reform of the scientific and technological structure. In 1982, the central authorities again put forward the strategic and science and technology must gear their work to the needs of economic construction." Last year, we reformed the scientific research structure and introduced to the research units the contract system of carrying out internal research activities financed with their own funds instead of depending on the state for operating funds. At the beginning of this year, the central authorities again made a decision on reforming the science and technology structure. Such practices are our important basis and guide in carrying out reform. In order to better implement the series of principles and policies of the central authorities on the reform of the scientific and technological structure, our province has proceeded from reality, and issued more than ten policy documents to lower levels on the structure of scientific research, management of talented scientific and technical people, technological transfer and services, and so forth. It has also set forth detailed regulations for carrying out scientific and technological structural reform at this conference. All comrades on the scientific and technological front, comrades on the economic front, and party and government leading comrades should conscientiously study and understand the central principles and policies and the policy documents of our province. We should use the party's principles and policies to unify the people's thinking, to guide the practice of reform, and enable the people to concentrate their minds and efforts on this aspect of work so that scientific and technological structural reform and the economic structural reform can promote each other, progress simultaneously, and develop coordinatively.

All departments and units should conscientiously implement the central principles and policies and the province's relevant policy documents on reforming the science and technology structure. Some units and persons have resorted to tricks which run counter to policies. They have exploited the advantage of reform to deceive their superiors and to delude their subordinates, and adopted crooked ways to seek benefits for themselves or for a small group of persons. Such practices are absolutely forbidden. We should criticize, educate the people who have violated law and discipline, and should strictly handle such cases. We should prevent different departments from issuing different policies and each person from going his own way. In the future, the issue of

all important policies concerning the reform of the scientific and technological structure should be studied and formulated in a unified manner by the provincial Scientific and Technological Commission and be implemented after being approved by the provincial CPC Committee and government.

We should pay attention to drawing clear lines of demarcation in applying the policies concerning the scientific and technological structurel reform. First, we should draw a line of demarcation between faults caused by inadequate experience in the course of exploration and unhealthy trends practiced by some persons under the pretext of reform. Second, we should draw a line of demarcation between the legal income distribution of scientific research units in accordance with the relevant policies and the arbitrary issuance of bonuses. Third, we should draw a line between the legitimate income of scientific and technical personnel and their dishonest work as well as the practice of putting profit-making above everything else. Fourth, we should draw a line between technical trading organs operated by scientific and technological departments, organizations, and units and enterprises operated by party and government organs.

The issue of policies, which we should take seriously, is very important in our reform of the scientific and technological structure. Scientific and technological committees at various levels should closely coordinate and fully cooperate with economic, planning, financial, tax, credit, personnel and labor, and industrial and commercial administrative departments to conduct successful studies of policies for reform. Research departments of CPC committees and governments should also strengthen the study of policies for reform so that they can give guidance for the smooth progress of reform of the scientific and technological structure.

3. On the Issue of Talented Peoples

Central leading comrades attach importance to talented people. At the national scientific and technological work conference, Comrade Xiaoping said: "In reforming the economic structure, the most important part and what I am most concerned about is talented people. In reforming the scientific and technological structure, what I am most concerned about is still talented people." Comrade Ziyang pointed out that in accomplishing the four modernizations and revitalizing China, "the biggest problem is still in talented people because we lack qualified scientific and technical personnel and managerial personnel," and that "whether the economy of our country can achieve a leap forward and have reserve forces is determined by whether the scientific and technological work and the educational work can greatly develop and the problem in talented people can be smoothly solved." Talented people are the most valuable resources, and the key to the success or failure of the four modernizations. We should attach great importance to the issue of talented people.

Judging from the actual conditions of our province, the conspicuous problems are: First, a lack of talented people; second, a failure in giving full play to the role of the existing talented people. Comparatively speaking, the second problem is more urgent. The existing scientific and technical personnel should be relied on for carrying out the current work and training talented people for the future. CPC committees, governments and pertinent departments at various levels should pay close attention to the full performance of the existing scientific and technical personnel. In order to give full play to their role, we should pay attention to solving the following problems at present.

We should conscientiously solve the problem of ownership of talented people by units or departments. It is necessary for various departments or units to maintain relative stability in their scientific and technical personnel. However, they must not think that they own these talented people, still less must they prohibit transfer of them. Talented people are a valuable commodity of the state who are not owned by any individual department or unit. We should thoroughly reform the system of scientific and technical personnel management, and implement the system of employment for technical posts and the system of personnel replacement to ensure the rational transfer of talented people. Everybody should recommend talented people. Talented people themselves may also "volunteer their services as Mao Sui did." Personnel departments at various levels should make connections and lend services for those who volunteer to work at certain units. When scientific and technical personnel are transferred from large to small units or from state to collective units, it is permissible to give them proper preferential provisions in wages and living conditions as long as they and the units concerned agree to do so. We should not intervene too much.

We should further break with the "bit rice pot" and overcome egalitarianism. We should truly carry out the socialist distribution principle of "getting more pay for more work and being paid according to work," and grant handsome rewards to those scientific and technical personnel who have made prominent contributions.

We should further improve the working and living conditions of scientific and technical personnel. Within the scope stipulated by the policies, the province, various cities, prefectures and counties, and various departments and units should try to solve as many practical problems for scientific and technical personnel as possible. At present, they should think of ways to solve the housing problem for scientific and technical personnel and the problem of the employment of their children, in order to rid them of worries about their homes as much as possible and enable them to carry out their work successfully with concentrated efforts. We should create favorable conditions for scientific and technical personnel to renew their knowledge and improve their levels through training. We should also show concern for their health and provide conditions to make their medical treatment convenient.

We should further solve the difficulty of intellectuals joining the party. We should actively carry out political and ideological education and the work of organizational expansion among intellectuals in order to recruit fine intellectuals in a timely manner who possesses the qualifications for party membership. All in all, we should fully trust scientific and technical personnel politically, use them to do work boldly, show concern for, and take care of their lives and give full play to their role.

4. On the Issue of Strengthening Ideological and Political Work

The central leading comrades pointed out: "Overall reform of the scientific and technological structure is a very great move. It requires the people to change their style of activities, the organizational structure, and certain ideas and concepts that they have become used to for several decades." Facing such a revolution, the masses need to solve many ideological problems, and so do the people within the party. Therefore, it is necessary to conscientiously strengthen the ideological and political work of reform. We should not weaken it, still less replace it with other methods. Through forceful ideological and political work, we should raise the people's awareness, unify their thinking, arouse their enthusiasm, surmount the various ideological obstacles to reform created by the influence of "leftist" ideas and the force of old habits, and ensure and promote the smooth progress of reform.

The ideological situation on our province's scientific and technological front is, generally speaking, good. Most cadres and scientific and technological workers have actively supported reform, taken the initiative in participating in it, and scored great achievements in it. However, some problems have been exposed following the gradual deepening of reform. Some of them do not emancipate their minds and have rather many misgivings, daring neither to offer suggestions nor to conduct exploration. Some adopt a wait-and-see attitude, hesitate, and are overcautious in carrying out reform for fear of making mistakes. Some have a negative attitude toward reform for fear of suffering losses. Some have the attitude of "scholars tending to scorn each other," and are unwilling to cooperate with other or even counteract each other's efforts and do not share their technology with others. A small number of them take advantage of reform to earn "extra income" and engage themselves in malpractices in the name of reform. Most of these problems are of ideology and understanding, which should be solved earnestly through painstaking and meticulous ideological work.

We should continue to organize the masses of cadres and scientific and technological workers to penetratingly study the CPC Central Committee's decision on reform of the scientific and technological structure and the speeches of the central leading comrades, unify their thinking in line with the "decision," firmly follow the direction of reform, heighten the spirit of reform, and unswervingly carry out the reform successfully.

We should conduct education in ideals and discipline among the broad masses of cadres as well as scientific and technical personnel. Comrade Deng Xiaoping put forward that we should educate the whole nation to have ideals, morality, culture, and discipline. Ideals and discipline are the two most important ones. We should educate and guide the broad masses of scientific and technical workers to foster and strengthen the lofty communist ideals, and to contribute all we have to the cause of socialist modernization and the realization of lofty communist ideals.

We should make the broad masses of scientific and technical workers deeply understand that discipline is the guarantee for the implementation of the party's line. Without unified discipline, there would not be unified actions. Comrades on the scientific and technological front are comrades with a fairly high cultural level. Therefore, they should serve as vanguards who have ideals, morality, culture, and discipline.

Ideological and political work is a science subject and great knowledge. During the new historical period, we should conscientiously study and actively explore ways to make ideological and political work better cater to the needs of economic construction and serve socialist modernization construction. In line with the regular patterns and the characteristics of scientific and technological work, the scientific and technological front should purposefully carry out ideological and political work, enable it to permeate every link of production and scientific research, integrate administrative and economic means with ideological education, and combine our efforts to solve ideological problems with that to solve practical problems. Ideological and political activities should be lively and the methods should be flexible so that ideological and political work will become more lively and will yield better results. In ideological work, it is important to arouse the consciousness of the people. We should be patient and meticulous and should guard against doing things in an oversimplified and crude way. We should promote the practice of holding heart-to-heart talks and making friends with scientific and technical personnel and becoming their real bosom friends.

With the development of reform, a number of advanced personages who dare to explore and to blaze new trails have emerged on our province's scientific and technological front. Among them, many are scientific and technical workers and leading cadres. We should sum up the experiences of those successful persons, publicize and popularize their experiences, and vigorously commend them so as to create a social habit of learning from and catching up with the advanced. We should not demand perfection of those cadres with a pioneering spirit. It does not really matter to have shortcomings and defects. We should earnestly help them, encourage them, and cherish their reform initiative.

Comrades, the current situation in all respects is very good. We have enjoyed political stability and unity and have achieved a sustained, stable, and coordinated economic development. This excellent situation has created favorable conditions for us to deeply carry out reform of the economic structure, the scientific and technological structure, and educational structure. We are convinced that after this conference, the decision of the central authorities on the reform of the scientific and technological structure will be further implemented, which will thereby effectively mobilize the enthusiasm and creativity of the scientific and technical workers, greatly liberate the scientific and technological productive forces, promote the modernization of science and technology, a closed integration of science and technology with production, and the development of industrial and agricultural production, and create a new situation in our province's scientific and technological work as well as in economic construction.

CSO: 4008/2002

NATIONAL DEVELOPMENTS

HUNAN VICE GOVERNOR MEETS POLISH SCIENTIST

HK090747 Changsha Hunan Provincial Service in Mandarin 2300 GMT 8 Oct 85

[Text] On the afternoon of 6 October, Vice Governor Chen Bangzhu met and feted at (Rongyan) Hotel, Professor Litwiniszyn, vice president of the Polish Academy of Sciences, and his party.

At the invitation of China's Ministry of Coal Industry, Professor Litwiniszyn and his party attended the international academic conference on mining technology, which was held in China. They arrived at Changsha in the evening of 5 October after the conclusion of the conference. This is the first visit by the Polish Academy of Sciences delegation to the province.

In the course of the meeting, Vice Governor Chen Bangzhu praised the efforts of Professor Litwiniszyn in the areas of strengthening Sino-Polish scientific and technological exchanges, and allowing the province's technicians to study at the research institutes of the Polish Academy of Sciences.

Over the past few days, Professor Litwiniszyn and his party went to the former residence of Comrade Mao Zedong and the exhibition hall at Shaoshan. The professor also gave lectures at Xingtan College on the mining industry. The guests will depart Changsha for Beijing.

CSO: 4008/2002

NATIONAL DEVELOPMENTS

SENIOR CADRES TRAIN IN SCIENCE, ADMINISTRATION

OW271110 Beijing XINHUA in English 1030 GMT 27 Sep 85

[Text] Beijing, 27 Sep (XINHUA)--More than 200 Chinese ministers and vice ministers and 260 mayors have taken training courses in science and administration since the beginning of 1984.

Also during this period more than 1,000 department and bureau directors under the ministries and commissions of the State Council, 100,000 cadres at the prefectural and municipal level and several thousand army officers above the division level have attended lectures on administration and technology.

These training classes and lectures were sponsored by a group from China's National Association of Science and Technology, a mass organization made up of experts and scholars of various natural and social science disciplines.

Professor Yang Peiting, deputy head of the group, told XINHUA today that China's senior and middle rank cadres needed a better understanding of scientific methods of administration as well as grounding in new technological methods.

Tian Fu, vice-president of the association, said that many younger cadres with a higher education and professional expertise had been promoted to leading posts over the past few years. These people also needed some refresher courses to keep up with developments in modern science and technology, he said.

The training courses, according to Tian, were divided into eight aspects involved in leadership: science, strategy, information, administration, systems engineering, economics, education and aptitudes, and the future.

He said that training in these disciplines should help cadres acquire a strategic viewpoint, a sense of the future, a creative spirit and a scientific outlook.

The training of cadres has received the active support of party, state adn army leaders since it started. Premier Zhao Ziyang and other officials took the lead in attending these lectures.

Last year, Fujian Province invited the group ot lecture to government functionaries at the prefecture and municipal levels.

At present, Henan Province has some 7,400 county officials and party leaders, about a third of the provincial staff, attending courses on a ientific administration.

Senior officers of the general staff, the general logistics department, the air force and the Military Academy of the Chinese People's Liberation Army are also taking training courses. One lecture series in Shenyang was attended by 1,700 officers at the above division level in the Shenyang Military Region.

CSO: 4010/2001

NATIONAL DEVELOPMENTS

PRC TO HOLD NATIONAL INVENTION EXHIBITION

OW2811135 Beijing XINHUA in English 1041 GMT 28 Sep 85

[Text] Beijing, 28 Sep (XINHUA)--China's first national exhibition of inventions will be held here in October, the Preparatory Office of the Chinese Invention Association reports.

On display will be 346 inventions and scientific research findings. These cover electronics, architecture, medicine, agriculture, the chemical industry, transport and communications and technology.

During the exhibition, winners of awards will be chosen, and technical or technology transfer trade will be conducted. Inventions also will be selected for display in the 14th International Exhibition of Inventions and New Techniques scheduled in Geneva, Switzerland.

Since China devised regulations on invention awards in 1978, 976 inventions have won national invention awards. Thirty two of the inventions have earned economic returns of more than 100 million yuan each. Incomplete statistics show that all the inventions have yielded 26 billion yuan in various fields.

The State Council has decided to establish an Invention Association of China to encourage inventions, creativity and to promote wider application of scientific research. The association's inaugural meeting will be held during the October exhibition.

CSO: 4010/2001

NATIONAL DEVELOPMENTS

OFFICIAL DISCUSSES NEW INVENTION ASSOCIATION

OW051250 Beijing XINHUA in English 1230 GMT 5 Oct 85

[Text] Beijing, 5 Oct (XINHUA)--The China Association of Inventions, which will be set up here 16 October, aims at encouraging and instructing the people to use their creativity and promoting the application of inventions and scientific research findings in production, a leading official from its preparatory office told XINHUA today.

As a mass organization, Wu Heng said, the association members will include scientists, workers, peasants, soldiers, cadres and students.

Wu, now 71, is chairman of the Recommendation and Examination Committee for Inventions under the State Science and Technology Commission. In August last year, he was awarded a gold medal by the World Intellectual Property Organization for his contributions to establishing a patent system in China and promoting international cooperation.

He said the association will also protect the legal rights and interests of inventors, actively participate in international exchange activities and establish good relations with related world organizations.

At present, the association's preparatory office has ties with invention associations in Japan and Yugoslavia.

Last April, 19 Chinese inventions and techniques were displayed at the 13th International Exhibition of Inventions and New Techniques in Geneva, Switzerland, and 11 of them won prizes, Wu said.

China will sponsor its first national exhibition of inventions in Beijing next week, with 346 inventions and scientific findings on show, he said. Forty inventions will be selected from the exhibits for display at the 14th International Exhibition of Inventions and New Techniques in Geneva next year.

Wu Heng noted that since China devised regulations on invention awards in 1978, nearly 1,000 inventions have won national awards and, since the country's patent law went into effect April 1 this year, the Chinese patent bureau has received more than 10,000 applications.

In addition, there are tens of millions of schoolchildren and young workers participating in small invention contests in various forms across the country, Wu said.

CSO: 4010/2001

NATIONAL DEVELOPMENTS

1700 SCIENTIFIC RESEARCH ACHIEVEMENTS AWARDED

OW071822 Beijing XINHUA in English 1510 GMT 7 Oct 85

[Text] Beijing, 7 Oct (XINHUA)--A water-injection technique to help Daqing, China's largest oilfield, sustain a stable and high output, a technique for producing maleic rubber and 21 other scientific achievements have won special-class awards for promotion of scientific and technological advances.

The National Committee for Examining Science Advance Awards announced here today that altogether 1,772 scientific research achievements have received awards, decided at the committee's second meeting held in Beijing recently. The awarded achievements include 134 first class, 537 second class and 1,070 third class ones.

This was the largest number of awards for scientific and technological research in China since the founding of the People's Republic in 1949, the committee said.

The Daqing oilfield has registered high yields for nine successive years with an additional production of 42 million tons of crude oil due to improved techniques. The new water-injection technique will help the oilfield attain stable production for 15 years.

The maleic rubber production technology, independently developed by Chinese scientists, has turned out 480,000 tons of such rubber and in 1983 alone produced 170 million yuan in profits and tax for the state. The rubber has also been exported.

Other achievements winning special-class awards include the new technology used in building the Nanjing Yangtze bridge and the Chengdu-Kunming railway in southwest China, the Geshouba hydroelectric project, a radio measuring and control system for satellite carriers, the "Changzheng No. 3" carrier rocket, the "Xiangyanghong Nom Ops scientific survey ship and a microwave measuring and control system for an experimental telecommunications satellite.

The first-class award winners include a computer system (10 million operations per second), technology for breeding prawns, a treatment for cancer, electroplating technology for repairing machine parts, a 3,000 rpm turbo-generator with inner water-cooled stator and rotor, and research on burns.

Also winning prizes are advanced technology for updating the country's weaponry and military equipment such as nuclear weapons, fighters, tanks and vessels.

In September last year, China promulgated the regulations on awards to promote scientific and technological advances to encourage scientists to contribute to the country's socialist modernization, and groups or individuals making creative contributions to the spread of scientific research results.

The regulations stipulate that scientific research results, including products, technology, processes, designs, animal breeds and crop varieties, must be new to China, or up to advanced world level, or advanced in their respective sectors.

Yang Jun, chairman of the examination committee, said that the award winners were selected fromover 1,000 items recommended from various parts of the country.

He said the aware winners are of high technological level and have brought remarkable economic and social benefits. Incomplete statistics show that a combined economic return of 22 billion yuan has been brought about by 10 special-class and 12 first-class winners.

CSO: 4010/2001

NATIONAL DEVELOPMENTS

SYSTEMS ENGINEERING IN CHINA SURVEYED

Beijing XITONG GONGCHENG LILUN YU SHIJIAN [SYSTEMS ENGINEERING THEORY AND PRACTICE] in Chinese No 1, 1985 pp 1-3

[Article by Xu Guozhi [6079 0948 1807], Chen Li [7115 4539] and Gu Jifa [7357 1015 4099]: "Development of Systems Engineering in China"]

[Text] I. Introduction

China has long had systems, but the organized application of systems engineering began in the early 1960s. At that time, certain missile development departments established a general design bureau in charge of the organizational management of missile research, development, production, testing and utilization; in addition these departments used certain internationally accepted systems engineering methods such as the project coordination technique (also called the network chart technique).

But larger-scale systems engineering research and applications began only in the mid-1970s. Nonetheless, several of its important components, such as operations research, control theory, management science, and information theory, began to develop in China during the 1950s and 1960s. Because of space limitations, below we describe only systems engineering developments of the last few years in China.

II. Current Status of Systems Engineering in China

Chinese specialists began to consider the development aspects of systems engineering as a scientific field in the mid-1970s; it was given wide publicity, most influentially in the article "Systems Engineering: A Technique of Organizational Management" published in September 1978 by Comrade Qian Xuesen [6929 1331 2777] in WEN HUI BAO. At about this time, the Ministry of Education, the Aeronautics Society, the Automatic Control Society and the Management Modernization Society held a series of conferences on systems engineering and did good preparatory work in publicizing and popularizing systems engineering and organizing personnel in the field. In October 1979, the Defense Scientific and Technical Committee and other units jointly held an academic conference on systems engineering in Beijing, at which 21 specialists including Qian Xuesen and Yuan Zhaozhi [7070 5128 4160] proposed to establish the China Systems Engineering Society. After more than a year of planning, the China Systems Engineering Society was established in October 1980 and

elected a leadership group with Qian Xuesen and Hu Yaolao [3641 2550 1890] as honorary chairmen and Guan Zhaozhi as director. To date, the society has held three annual meetings, and its specialized committees have held 13 specialized conferences. In addition, it has held two international conferences with other organizations: the Sino-American Systems Analysis Conference (Xi'an, 1981) and the Beijing International Systems and Control Conference (1984). The events of the last few years indicate that systems engineering in China has the following characteristics.

A. Great expansion of the use of systems engineering.

Four or 5 years ago, most of the reports presented at systems engineering conferences dealt with publicity, dissemination and preparations for applications. But as a result of the efforts of people in the systems engineering field, it is now finding practical applications in military affairs, social and economic matters, energy, agriculture, mining, water conservancy, environmental affairs, communications, population, large-scale project management, enterprise management, and education, and has already produced some results. In addition, a variety of mathematical models have been established for various projects, and are now being used to perform experimental calculations with real data or are currently being considered for applications.

B. The organized ranks of research personnel in systems engineering are expanding rapidly.

In recent years there has been a rapid expansion of the number of systems engineering personnel in all departments. The Systems Engineering Society has already established specialized committees on military affairs, social and economic matters, fuzzy mathematics [i.e., fuzzy set theory and related disciplines] and fuzzy systems, and systems theory. In addition, specialized activities already existed in such areas as agriculture, mining, water conservancy, and information; these groups have applied to establish specialized committees, and departmental approval is now pending. Large numbers of local societies have been established or are being planned. Many other societies have established systems engineering committees or similar organizations. In addition to academic organization, as of June 1984, China had nearly 180 organizations engaged in systems engineering, and 3,000 research personnel. Some new trends have recently appeared: (1) Major national departments (military, governmental, scientific, educational, and the like) have established large numbers of relevant organs which will lay an excellent foundation for normalizing systems engineering applications and research. (2) The county-level organizations and some local scientific units are showing extensive interest in the utilization and dissemination of systems engineering, which will provide an excellent basis for future mass-scale applications. (3) The contingent of personnel with training in systems engineering is becoming steadily stronger. The Ministry of Education made an effort in this area early, establishing schools that emphasized the development of systems engineering and trained useful personnel for the country. Some of China's universities have established systems engineering curricula and trained some MA students. The graduate-level classes currently

being given, particularly for training PhDs, will lay an excellent foundation for a systems engineering contingent with specialized training. In addition, there are numerous systems engineering training classes of various types in various fields such as agriculture, energy, military affairs, water conservancy, mining, mechanical engineering and the like, in addition to classes geared to different types of work, e.g., for cadres, management personnel and technical personnel. (4) Popular education is underway. Television and radio stations are broadcasting systems engineering lecture courses, and a variety of brief training classes for leadership cadres are being held (e.g. mayors' classes and the addition of a great deal of systems engineering content to the course of lectures on the scientific and technical revolution held for the central party and government organs), which have spread the knowledge of systems engineering. However, some leaders plan to use systems engineering as the sole technique for improving management, so that systems engineering experts have had to warn that systems engineering has its limitations and is only one of many important techniques for improving management, not a panacea.

III. Comparison with Developments Abroad

China's systems engineering development began late and is 20 or 30 years behind that of abroad. In addition, China is extremely weak in theoretical research on systems engineering compared with other countries. In other countries there are already several schools of thought, while most cadres in China are still in the stage of learning from other countries and mastering the knowledge in the field. Several articles by Comrade Qian Xuesen describing China's characteristics and level of attainment deserve mention. It must be realized that the knowledge of systems engineering abroad is in a rather chaotic state; Qian Xuesen's understanding of the subject is much more penetrating, since he has been able to relate it to Marxist philosophy. His thinking in systems science is expressed primarily in his having proposed a clear systematic structure for modern science and technology. In addition, he believes that systems engineering is a technique of organizational management which systematizes traditional organizations management as a scientific technique and makes it quantitative in order to allow mathematical methods to be used. He believes that systems engineering is a name for a large category of engineering techniques rather than a single science. This provides a clear depiction of systems engineering and describes its place among the totality of systems sciences, thus providing a certain basis for unifying the systems engineering field in China.

In contrast to its status in systems science, China is catching up rather rapidly in research on the various specific methods of systems engineering, and some techniques have found rather widespread application. In addition, large numbers of articles have been published in certain areas such as operations research, control theory and fuzzy mathematics; some are at the world state-of-the-art level and have been published in international journals. In applications, China has been able to make rather skillful use of certain techniques of the 1960s and 1970s in military affairs, energy and agriculture. But there are great discrepancies in the scale and depth of their application. For example, linear planning models used abroad include as

many as a million variables, while in China we can handle only a few thousand variables. In interger planning, which is very important in such problems as deciding on investment projects, as many as 2,000 variables or more have recently been taken into account in foreign investigations, while in China only a few dozen variables can be handled. China is also making relatively little use of certain rather profound quantitative techniques and of certain qualitative techniques that are widely used abroad. In addition, because the ability of Chinese systems engineering experts to integrate knowledge is inadequate, those who understand economics have insufficient training in mathematics, while mathematicians have insufficient knowledge of economics or engineering, and overspecialization is common among mathematicians. Abroad, however, some systems engineering specialists have much broader knowledge than we do, so that they are more able to put their conceptions into practice. In some topics there is a stubborn insistence on working from existing capabilities. We currently lack high-level systems engineering organizers who combine specialized knowledge with a knowledge of organizational management. In time, this will hinder the completion of certain large-scale projects. The use of computers in the field is already more or less universal in other countries, but the older generation in Chinese systems engineering cannot use computers or, while understanding them, still lacks experience with methods and applications. In addition, we still lack a full range of software suited to systems engineering applications and some of the imported software is inadequately utilized.

We are also rather far behind other countries in data accumulation. Lack of data, inaccurate data, or difficulties in using data are actually causing a great deal of our systems engineering personnel's energy to be wasted or are actually hindering progress on some topics.

Obviously, support from the leadership is a favorable factor in this area. Actually, some central leaders have already issued important instructions on the application of systems engineering and have encouraged China's systems engineering personnel and stimulated certain departments to require the use of systems engineering. They have created new situations that favor its use. But problems still remain, primarily because of a lack of knowledgeable manpower, which often leads to undue haste; starting work today and expecting results tomorrow, because of a failure to understand that systems engineering work takes considerable time. In some other cases we find the opposite attitude: the belief that systems engineering has no value and an unwillingness to utilize it, or an uncooperative attitude, which also makes it hard for projects to succeed.

IV. Prospects for the Year 2000

A. In regard to theory, China will not only have mastered some advanced, mature foreign methods, but in addition will have mastered a great deal of the basic theory of systems science and will have developed a distinctive Chinese style in certain branches.

B. In applications, we will use the distinctive characteristics of China's planned economy to develop a distinctive style in dealing with certain

large-scale national systems engineering projects (such as the national economic planning system, the energy system, national agricultural planning and the like); some of these characteristics will become important projects worldwide. Many large and medium-sized engineering projects will be underway; all of the links, such as general planning, production organization, and operations and testing will use various systems engineering methods, either throughout or partially, and there will be combined utilization of quantitative and qualitative scientific methods as well as integration of quantitative methods and leadership decisionmaking.

C. In manpower education, in addition to making use of undergraduate and graduate students trained by the regular training system, we will also have scientific-technical and management personnel already in jobs, who will have had more than 10 years training; among their personnel there will appear experts, such as general economic planning leaders, general strategic design leaders and national defense strategy design leaders, similar to the general missile design leaders currently working in the Ministry of Aviation. The specialized research contingent will expand further, first topping 10,000, after which the characteristics of systems engineering leaders in various specific systems will emerge, e.g., engineering systems engineers, agricultural systems engineers, mining systems engineers and the like, and their numbers will increase to the hundreds of thousands. The personnel who currently have only specialized knowledge, will, as a result of studying systems engineering, gradually develop an integrated knowledge, with the result that some departments with mature applications will proceed from integration to certain types of specialization, e.g., relating systems engineering closely to some specialty.

D. The great majority of systems engineering workers will have learned to use computers and there will be a complete range of software in most areas. Most models will have integrated. Multiple man-machine interaction will have become possible and it will be possible to share software and discuss models via computer networks.

Because of the limitations of our knowledge and time constraints, the above article unavoidably contains errors and gaps; correction is therefore welcomed.

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NATIONAL DEVELOPMENTS

BRIEFS

SHAANXI TECHNOLOGY TRADE FAIR ENDS 28 SEP--The 15-day provincial technological achievements trade fair concluded yesterday. The province's first technological achievements trade fair has had marked results. According to statistics, some 3,460 transactions were concluded involving some 438 million yuan, of which 146 million yuan was for technological achievements items and 292 million yuan for trial orders of new products. At yesterday's closing ceremony of the fair, provincial Vice Governors Zeng Shenda and Lin Jizhou awarded certificates of merit and bonuses to the commended units. [Excerpts] [Xian Shaanxi Provincial Service in Mandarin 1130 GMT 29 Sep 85]

CSO: 4008/2002

PHYSICAL SCIENCES

NEW PROCEDURE FOR DECODING CYCLIC CODES DESCRIBED

Beijing SHUXUE DE SHIJIAN YU RENSHI [MATHEMATICS IN PRACTICE AND THEORY] in Chinese No 3, Jul 84 pp 32-36

[Article by Liu Guanyu [0491 6306 1342] of the Hunbei Electrical Academy]

[Text] Here we probe the use of checking polynomials for direct decoding. Capable of correcting random and burst errors, they are a kind of general method for cyclic codes.

Basic Notation

With the checking polynomial $h(x)$ for cyclic code (n,k), the receiving vector is $w(x)$ and the error code pattern is $E(x)$. With $\bullet$ and $\oplus$ representing addition and multiplication mod $(x^n + 1)$ then $F_2[x]_{x^n+1}$ constitutes a commutative ring.

1. Decoding formulas

Theorem 1. Notation

$$D_1(x) \triangleq h(x) \odot R(x) \tag{1.1}$$

then if the error detecting formula $D_1(x) = 0$ there is no code error otherwise there is code error.

The error correcting formula is

$$h(x) \odot E(x) = D_1(x). \tag{1.2}$$

Error detecting method. Notation $R(x) = \sum_{i=0}^{n-1} r_i(x)^i$, then

$$D_1(x) = r_0 h(x) \oplus x \odot [r_1 h(x) \oplus x \odot [r_2 h(x) \oplus \cdots \oplus x \odot r_{n-1} h(x)]]. \tag{1.3}$$

The above formula illustrates, each time a code element is received the accumulator makes a cyclic shift. If $r_i = 1$, the contents in the accumulator are increased by $h(x)$. Otherwise they are not.

Notation

$$D_i(x) \triangleq D_{i-1}(x) + x^{\cdots}\odot h(x), \quad i = 1, 2, \cdots, t \tag{1.6}$$

t is the error correcting capability. $D_i(x)$ is the ith rank decoding polynomial. This is a recursive formula. From $D_{i-1}(x)$ we seek $D_i(x)$, $i \leq t$.

Theorem 2. If $D_i(x) = 0$, $D_{i+1}(x) = 0$, then the error code pattern is $E(x) = \sum_{k=0}^{i-1} x^{j_k}$ moreover when $i \leq t$, $D_i(x) = 0$ and $E(x)$ is unique.

Definition. Write the powers of any terms with non-zero coefficients in $D_i(x)$ as d_i, and the set of powers of all non-zero terms in $h(x)$ as H, then define

$$E_i \triangleq \{d_i \in h \ \ldots\}, \tag{1.5}$$

$$E_i \triangleq E_i \setminus J_{i-1}, \quad i = 1, 2, \cdots, t-1 \tag{1.6}$$

J_{i-1} is the set of elements that can be deleted from E_i.

Theorem 3. Set up a power of any term in $E(x)$ as j_i, then we have

$$j_i \in E_i. \tag{1.7}$$

Proof. From (1.6) we get $D_i(x) = \left(\sum_{k=0}^{i-1} x^{j_k}\right)\odot h(x)$. In $\sum_{k=0}^{i-1} x^{j_k}$ there must be a term x^{j_k}, and in $h(x)$ there must be a term x^{h}, corresponding to any term x^{d_i} in $D_i(x)$. Also we have $j_k = d_i \ominus h$, so from the formulae (1.6), (1.5) we get $j_k \in E_i$.

II. General Decoding Procedure

In (1.5), each member of the elements in E_i^* is equal to the terms of $h(x)$, so in order to reduce the quantity of calculation work we want to sift through the elements in E_i^*. Obviously, those elements repeated throughout can be eliminated.

Notation Definition. Write $E_i^{\overline{j}}$ to mean the set of elements which have not yet been test calculated from those previously calculated. For example, with $E_i = \{j_{i1}, j_{i2}, \cdots, j_{if-1}, j_{if}, \cdots, j_{ih}\}$. If f elements $\{j_{i1}, j_{i2}, \cdots, j_{if-1}\}$ have already been selected from previous calculation, then $E_i^{\overline{j}} = \{j_{if}, j_{if+1}, \cdots, j_{ih}\}$. Also set up j_{if} which is just in the process of test calculation to determine if it is the largest likely solution.

Theorem 4. The element set which can be eliminated from E_i^* is

$$J_{i-1} = E_i \cap (E_1 \cup E_2 \cdots \cup E_{i-1}). \tag{2.1}$$

Proof. Suppose $E_i^{r_1} = \{\cdots, j_{1k}, \cdots\}$, $E_i^{r_2} = \{\cdots, j_{2k}, \cdots\}$, $r_1 < r_2$, and $j_{1k} = j_{2k}$. If the largest likely solution can be obtained with j_{1k} from $E_i^{r_1}$, then certainly we can get it with j_{1k} in $E_i^{r_2}$ before and the element j_{2k} in $E_i^{r_2}$ can be eliminated [and all such elements can be] represented as $j_{\cdots} = E_{\cdots} \cap E_{\cdots}$, $s > \rho$, $\rho = 0, 1, 2, \cdots, s-1$.

In E_i there must be one or an odd number greatest likely solution elements. In (2.1) the reason for selecting $E_i^{r_1}$ was to insure at the very end in $E_i^{r_1}$ there would be only one solution element and to avoid eliminating other solution elements. Similarly, the goal in selecting $E_i^{r_2}$ ($i = 0, 1, \cdots, t-2$) was also to avoid eliminating useful solution elements in later calculations.

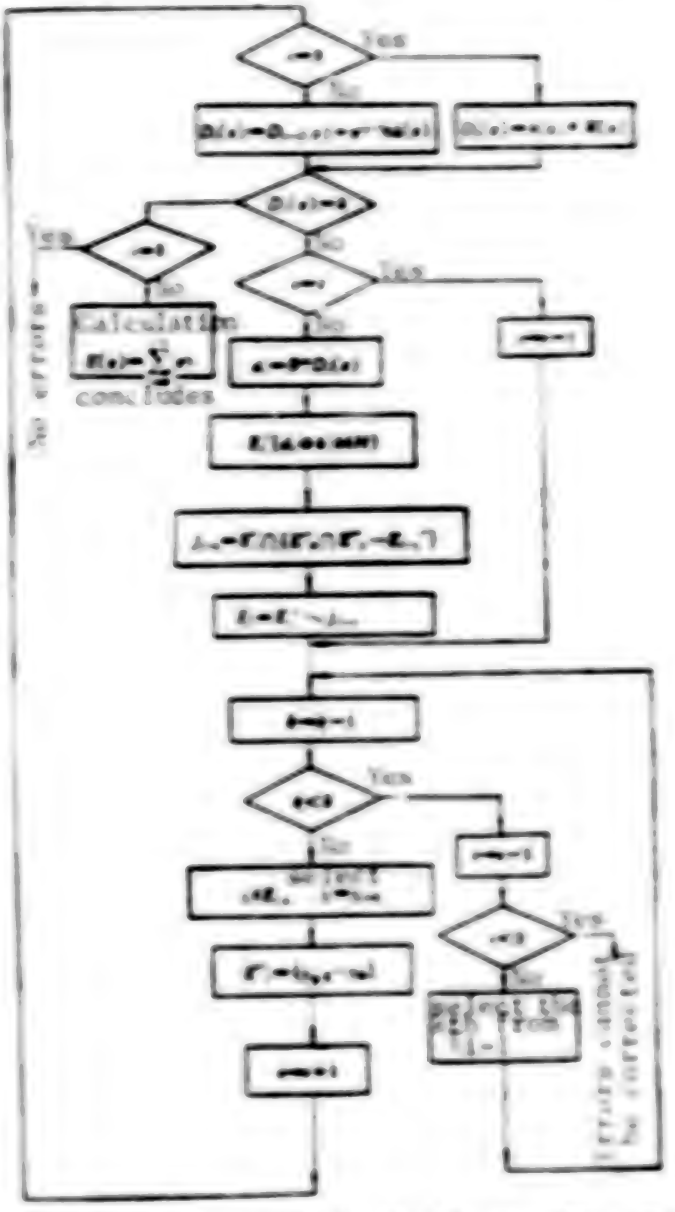

Figure 1. Block Diagram of the Cyclic Decoding Program

With $j_{-1} = E \setminus E_{-1} >$ writing in general form given formula (2.1).

Decoding procedure:

1. When $D_i(x) = s_{i-1} = 0, i = 2, \cdots, s-1$. In $D_i(x)$ selecting a term with non-zero coefficient its power is d_i, and $s = S^n[D_i(x)]$. From (2.1) get E_i^*, and also get j_{i-1} from (2.1). Last get E_i from (1.8).

2. From (1.7) selecting $j_i = j_{i,k-1}, \cdots, j_{i,2}, j_{i,1}$ is the kth element in E_i. Begin calculating from the largest value $\neq 0$ indicates the entire elements of j_i have not been completely selected and a new element to test can be chosen. At this time from (2.1) $E_i^* = j_{i,k-1}, j_{i,k-2}, \cdots, j_{i,1}$ Sometimes must time to shift out. From $j_i = j_{i,k-1}$ and (1.4) we get $D_{i-1}(x) = D_i(x) - x^{j_{i,k-1}}$.

Continue the calculations. If $k = k - 1 = 0$, this indicates that all elements have been selected from E_i and new elements must be selected separately from E_{i-1}. Supposing the previous calculation from E_{i-1} reached $j_{i-1} = j_{(i-1),1}$ then we should select $j_{i-1} = j_{i-1,\,k-1}$ and continue the calculation.

3. If $k < 0$, $i < 0$ it means that all the elements in E_i have been used and the code error surpasses the corrective capability and calculation is concluded.

4. If $D_i(x) \neq 0$, then a new element is selected from E_{i-1} and calculation continues.

5. Finally, reaching $D_i(x) = 0$, we get $E(x) = \sum_{j=1}^{n-1} e_j x^j$ and calculation is concluded.

The decoding program is shown in Figure 1.

The fundamental thinking for decoding when code errors are found is to ascertain the range of deviation error elements and then use $D_i(x) = 0$, $i > 0$ to examine whether or not it is a "largest likely solution." Because the deviation error elements are restricted to specific bits and are laid through the shifting set j_{i-1}, the quantity of calculations are reduced.

The quantity of calculations is determined by the number of elements in j_i and the correcting capability t. When t gets large, the number of bits will be reduced and the elements in E_i correspondingly decrease. When the length of the code increases, the elements in E_i^* can increase and simultaneously the shifting elements also will increase. In general, with increases in the length of codes and correcting capability, the quantity of calculations should not increase very fast.

We can also use more decoders and decoding to increase the speed of computations and the procedure for each decoder is nearly the same. Obviously, if $D_i(x) = 0$, $i \leq t$, t can be random or batch capability and when correcting batch errors $j_{max} - j_{min} \leq t - 1$.

Table 1. Process of Calculation for Golay Code (23, 12)

Formulae	Process of calculation $H = (12, 11, 10, 9, 8, 5, 2, 0)$
$D_0(x) = A(x) \otimes E(x)$	(22, 20, 19, 17, 11, 10, 3, 1)
$A_0 = \Phi D_0(x)$	
$E_0 = (A_0 \oplus A_{min})$	(22, 20, 17, 14, 13, 12, 11, 10)
$A_0 \in E_0$	
E	(17, 14, 13, 12, 11, 10)
$D_1(x) = D_0(x) + x^{n-1} \otimes A(x)$	(20, 11, 10, 6, 5, 4, 2, 1)
$A_1 = \Phi D_1(x)$	
$E' = (A_1 \oplus A_{min})$	(20, 18, 15, 12, 11, 10, 4, 0)
$J_1 = E \cap E'$	(12, 11, 10)
$E_1 = E \setminus J_1$	(20, 18, 15, 4, 0)
$A_1 \in E_1$	
E	(20, 18, 15, 4, 0)
$D_2(x) = D_1(x) + x^{n-2} \otimes A(x)$	(22, 14, 10, 9, 8, 7, 4, 1)
$A_2 = \Phi D_2(x)$	
$F = (A_2 \oplus A_{min})$	(22, 20, 17, 14, 13, 12, 11, 10)
$J_2 = E \cap (E \cup E')$	(20, 17, 14, 13, 12, 11, 10)
$E_2 = E \setminus J$	(22)
$A_2 \in E_2$	
$D_3(x) = D_2(x) + x^{n-3} \otimes A(x)$	⊕ ⊕ =
Largest likely solutions	$E = (17, 20, 22)$

IV. Example of Calculation Method.

From $f(x) = x^{n-1} + x^{n-2} + \cdots + x + 1$ write as $F = \{n-1, n-2, \cdots, 1, 0\}$ with Golay code (23, 12), t = 3, h(x) written as $H = \{12, 11, 10, 9, 8, 5, 2, 0\}$, $D_0(x)$ written as $D_0 = \{22, 20, 19, 17, 11, 10, 3, 1\}$, E(x) is written as $E = \{j_0, j_1, j_2\}$. The process of decoding is shown in Table 1. In the table the calculations of $j_0 = 22, 20$ is omitted and only the results when the sequence reached $j_0 = 17$ are represented.

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12966
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PHYSICAL SCIENCES

CONSTRUCTION OF n-STAGE M-SEQUENCES BY COMPUTER

Beijing SHUXUE ZA ZHIXUE YU JISUAN JI SHUXUE [MATHEMATICS IN PRACTICE AND THEORY] (a Chinese Ma), Jul 84 pp 31-36

[Article by Chao Wenbao [7115 2429 1405], of the Institute of Systems Science of the Chinese Academy of Sciences, and Chai Jiyuan [2139 4949 0337], of the 615 of the Ministry of Aeronautics]

[Text] The longest nonlinear shift register sequence, abbreviated as M-sequence and denoted as $(a_i, a_{i+1}, \cdots, a_{i+p^n-2})$, is a sequence with period p^n-1. The set of n successive elements in the sequence, $(a_i, a_{i+1}, \cdots a_{i+n-1})$ is called a state, and an n-stage M-sequence has a total of p^n-1 unique states. M-sequences possess relatively good pseudo-random and correlation characteristics as well as being numerous and easily acquired. Because of this, they have received important applications in communications and other engineering fields. For example, M-sequences can serve as address codes in multi-address communication, as direct sequences in direct sequence communications, for encoding in security communications, etc. A certain engineering task will use an M-sequence which must possess a certain kind of correlation characteristics. Because at present we lack deep applied theoretical accomplishments with respect to the correlation characteristics of M-sequences, we have adopted a general method: first construct an entire n-stage M-sequence, then use a computer to generate sequences with correlation characteristics to meet our requirements.

Concerning the construction of M-sequences there are already some methods. De Bruijn first proved that there are a total of $\frac{\varphi(p^n-1)}{n}$ M-sequences. This is termed a number theorem. Reference 2 provided a constructive proof of this number theorem. The proof contains a method to construct certain M-sequences. Wan Zhexian [8001 0772 0441] and others provided a new proof of this number theorem, adopting the language of graph theory. Their proof also materially contained a construction method for entire M-sequences. To the engineering tasks mentioned above, we have successfully adopted this construction method provided by Chinese mathematicians. Because computers cannot directly "see" graphs nor use graph theory methods to obtain theoretical results, a computer, and as simple as possible to implement the method of reference 2 required some "bridging" between mathematical proof and computer application. The present article is the crystallization of this "bridging" work. It presents a computer algorithm and program to construct entire M-sequences. The theoretical proof of the method can be found in reference 2 [illegible].

The algorithm is divided into two following procedures: (examples can be seen in the program)

I. Preparatory Work

1. Input a n-stage M-sequence

Take a state of a n-1 stage M-sequence (expressed in decimal numbers) and according to the order of the sequence enter it into the computer from the keyboard. For example, with n = 5 selecting the 4-stage M-sequence (000010011001111011), the state sequence is 0, 1, 2, 4, 9, 3, 6, 13, 10, 5, 11, 7, 15, 14, 12, 8, 1; which in order is entered into the array A(16), i.e., A(1) = 0, A(2) = 1, ···, A(16) = 8.

2. Storing the succeeding element of each state

Deposit the succeeding element of the state $(a_i a_{i+1} \cdots a_{i+n-2})$, a_{i+n-1} in the array Y(L$_i$). Here L$_i$ is the decimal representation of the state plus 1. Following the previous example, we have Y(1) = 1, Y(2) = 0, ···, Y(16) = 0.

3. Determine the state awaiting modification

$(a_i a_{i+1}, \cdots, \bar{a}_{i+n-1})$ and $(\bar{a}_i a_{i+1} \cdots a_{i+n-1})$ are termed a pair of conjugate states. Here $\bar{a}_i$ the "NOT" representation of a_i. Obviously when viewed as two binary numbers, the difference between the larger and smaller is 2^{n-1}. For this reason we can mate completely the relationships of the various states with their conjugates. Then for each state $(a_i a_{i+1} \cdots a_{i+n-2})$, according to the order of the sequence, we can assign a code $2^{n-1}-1-i$; and compare the two codes of one conjugate state pair, determining the state with the larger code to be the modified state and store it separately. We do not follow this procedure with that conjugate state which contains a 0 code. Following the previous example, use the relationship A(L$_7$) + A(L$_{10}$) = 8 to search out the conjugate state of A(L$_7$), A(L$_{10}$). Then use L$_7$ = 16 - L$_7$, L$_{10}$ = 16 - L$_{10}$ separately to represent the codes of A(L$_7$) and A(L$_{10}$). Comparing the magnitude of L$_7$ and L$_{10}$, store the larger code in the array B(7).

II. Constructing a M-sequence

1. Determine the initial state

For convenience, stipulate the initial state of the n-1 stage M-sequence to be $(a_0 a_1 \cdots a_{n-2}) = (00\cdots\cdots0)$ to be a state entirely of zeros.

2. Rule for construction of the succeeding element in the M-sequence

Beginning from the first state of the stipulated n-1 stage M-sequence, construct the succeeding element one by one according to the following method: $a_{n-1}, a_n \cdots$. Set up as one step a n-1 stage state as $(a_i a_{i+1} \cdots a_{i+n-2})$. Take out the succeeding element, a_{i+n-1}, of the state in question which was stored in step I.2. While we are at this storage cell for the first call make $\bar{a}_{i+n-1}$ be the succeeding element, thereupon the subsequent n-1 stage state is

IV. Construction of Entire n-Stage M-sequences

Input the 32 n-1 stage M-sequence and recurse through routine 1, ... till the entire n-1 stage M-sequences are all input and used up to construct $2^{(n-1)}$ entire M-sequences. The input of a n-1 stage M-sequence can also be done all at once. This subsequent selection is done by computer.

On a PDP-11/24 minicomputer (calculation speed 60,000/sec.) we input 16 M-sequences with n = 4 and constructed 2048 M-sequences with n = 5 using only 139 seconds of time (CPU run time), satisfying the requirements of engineering requirements.

Last we provide the source program for constructing 5-stage M-sequences. This program can be directly used by the engineering world.

Source Program for Constructing 5-Stage M-Sequence

```
                                                PROGRAM M5
C THE CALCULATION OF M SEQ
      INTEGER A(16), B(7), N(32), Y(16,2032)
      TYPE 20
   20 FORMAT(1X,' HOW MANY YOU WANT INPUT, . . N= ')
      ACCEPT *, NI
      TYPE 10
   10 FORMAT(1X,'INPUT YOUR NUMBER')
      ACCEPT *, (A(LJ),LJ=1,5)
      WRITE(6,15)A
   15 FORMAT(1X,'INPUT=',1X,16I1)
      DO 19 LJ=1, 5
      L2=A(LJ)+1
      LJ=MOD(L2,2)
      L2=L2/2
      Y(1,LJ)=MOD(A(LJ),2)
   19 CONTINUE
      J=1
      DO 29 L4=2, 5
      IF(A(L4).EQ. 1) GO TO 38
   29 CONTINUE
   38 L3=16-L2
      L6=A(L2)+1
      DO 39 L7=2,L3
      IF(A(L7).EQ.L6) GO TO 48
   39 CONTINUE
   48 L8=16-L7
      IF(L8.GT.L8) GO TO 49
      N(J)=A(L7)
      GO TO 50
   49 N(J)=A(L8)
   50 J=J+1
      IF(J.GT.7) GO TO 55
      GO TO 30
   55 N5=1
      K1=1
      K=1
```

```
      X(1) = 4
      K = 1
      DO 70 M1 = 1, 32
      I1 = X(M1) + 1
      IF(I1 .GT. 1) GO TO 75
      I2 = Y(I2) + 1
      I2 = MOD(I2, 2)
      GO TO 80
   75 I2 = Y(I1)
   80 Z(M1) = I2
      IF(M1 .EQ. 32) GO TO 99
      M2 = M1 + 1
      X(M2) = 3*X(M1)
      X(M2) = MOD(X(M2), 257)
      X(M2) = X(M2) + I2
      DO 91 M1 = 1, M1
      IF(X(M2) .EQ. X(M1)) GO TO 100
   91 CONTINUE
      K = 2
      GO TO 70
  100 K = 3
   70 CONTINUE
   99 MK = MK + 1
      WRITE(6, 101) MK, Z
  101 FORMAT(1X,I3, 1X, 32I1)
      IF(MK .EQ. 129) GO TO 300
      K4 = K4 + 1
      IF(K4 .GT. 64) GO TO 220
  220 K1 = K4 - 1000
      IF(K1 .EQ. 0) GO TO 230
      K2 = K1 - 1
      IF(K2 .EQ. 1) GO TO 135
      K2 = MOD(K2, 2)
      K2 = K2 + 1
  135 K3 = X(K2) + 1
      K1 = Y(K3) + 1
      Y(K3) = MOD(K1, 2)
      GO TO 40
  230 IF(K3 .EQ. 2) GO TO 210
      IF(K3 .EQ. 3) GO TO 205
      K2 = MOD(K3, 2)
      K2 = K2 + 4
      GO TO 210
  205 K2 = K2 + 1
  210 K3 = K3 + 1
      GO TO 135
  215 K2 = K3
      K3 = 1
      GO TO 135
  220 K4 = K4 - 64
      GO TO 225
  300 STOP
      END
```

Table 1. [illegible]

[illegible]														
[illegible]														
[illegible]														
[illegible]														
[illegible]														
[illegible]														
[illegible]														
[illegible]														
[illegible]														
[illegible]														
[illegible]														
[illegible]														

Table 2. Conditions for the first 9 modifications in the example

Number of modification	Corresponding cyclebus code word	Derived code [illegible]	State of [illegible] modification	Result [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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[illegible]
[illegible]

APPLIED SCIENCES

NEW METHOD OF PSEUDOCOLOR ENCODING THROUGH DENSITY SEPARATION

Hangzhou HANGZHOU DAXUE XUEBAO (ZIRAN KEXUE BAN) [JOURNAL OF HANGZHOU UNIVERSITY (NATURAL SCIENCES EDITION)] in Chinese Vol 12 No 3, Jul 85 pp 349-353

[Article by Tian Zhiwei [3944 1807 0251] and Shi Yongqiang [2457 3057 1730]]

[Text] Abstract: This article presents a new method of using the special diffraction characteristics of sinusoidal phase gratings to bring about image density separation and to obtain pseudocolor density coding by combining pseudocolors. Experimental results are also given.

Key words: optical information processing; image processing; pseudocolor encoding; density separation

I. Introduction

Research in vision makes clear that the color discrimination ability of the human eye is far stronger than its ability to directly discriminate among differences in black-white densities in images. Therefore, as a means of auxiliary interpretation, technology for pseudocoloration of black-and-white images is increasingly gaining greater attention. Since Goodman et al., first used an optical wave filtering method to carry out pseudocolor density encoding, this technology has undergone rapid development.[1-3] This article presents a new method of image density separation for carrying out pseudocolor encoding: the image is modulated with sinusoidal gratings, processed with bleach to make a phase grating with phase fluctuations following the density changes of the image, to serve as input to a white-light processing system. The difference between this method and that in Reference 3 is that this method uses a bandpass filter fitted with three primary color filters in a frequency spectrum plane to filter out diffraction orders 0, 1 and 2; separating the relative responses to each order of the low-density, medium-density and high-density areas of the image to be modulated, finally combining them at the output plane into a pseudocolor image output. This method does not require a hard-to-produce half-tone screen[1,2] or the repetitive photo preparation of the photographic method,[3] and is simple and practical.

Paper received on 23 November 1984.

1. Principles

It is known that an image with a density distribution of $D(x,y)$ can be obtained from its original negative, after modulation with a sinusoidal grating and bleach processing, its phase distribution and post-modulation frequency distribution will be directly proportional,

$$\theta(x,y) = \frac{\pi\gamma}{\lambda} D(x,y) \cos(2\pi f_0 x)$$

In the formula, γ is the factor of proportionality, f_0 is the spatial frequency of the modulation grating.

Using the preprocessed image as the input image for the 4f system, and given that the light source is a point white light source, with the spectral power distribution of $A^2(\lambda)$, after omitting the constant factors the input amplitude distribution is

$$u(x,y) = A(\lambda)\exp\left[i\frac{\pi\gamma}{\lambda}D(x,y)\right]\exp\left[i\frac{\pi\gamma}{\lambda}D(x,y)\cos(2\pi f_0 x)\right]$$
$$= A(\lambda)\exp\left[i\frac{\pi\gamma}{\lambda}D(x,y)\right]\sum_{n=-\infty}^{\infty} J_n\left[\frac{\pi\gamma}{\lambda}D(x,y)\right]\exp(i2\pi n f_0 x)$$

where $J_n(\cdot)$ is the n exponent's first-class Bessel function.

Let
$$c_n(x,y) = \exp\left[i\frac{\pi\gamma}{\lambda}D(x,y)\right]J_n\left[\frac{\pi\gamma}{\lambda}D(x,y)\right]$$

Then the input amplitude distribution can be written as

$$u(x,y) = A(\lambda)\sum_{n=-\infty}^{\infty} c_n(x,y)\exp(i2\pi n f_0 x)$$

Disregarding the lens' limited aperture, the spectral distribution is obtained on the system's frequency spectrum surface

$$U(\xi,\eta) = A(\lambda)\sum_{n=-\infty}^{\infty} C_n(\xi - nf_0,\eta),$$

where $C_n(\xi,\eta) = \mathcal{F}\{c_n(x,y)\}$.

The above formulas show that inputting the frequency spectrum $U(\xi,\eta)$ of the light field $u(x,y)$ on the frequency spectrum surface separating each component $C_n(\xi,\eta)$ with each $C_n(\xi,\eta)$ carried on its carrier frequency $(nf_0,0)$ distributed with the frequency coordinate $(nf_0,0)$ as the center of its region, forming the diffraction order of each. Their differing space distributions make us able under certain conditions to separate, through wavefiltering methods, the differing $C_n(\xi,\eta)$. The resolution ratio requirements of pseudocolor encoding are not high; it can be hypothesized that $c_n(x,y)$ is near the band-limited function; when f_0 is sufficiently high, it can be thought that the frequency spectra carried by each order's carrier frequencies are mutually separated. Therefore, on the frequency spectrum surface place a band-pass filter with nf_0 as the center, and merely let the frequency spectrum

carried by the nth order carrier frequency $U_n(\xi,\eta)$ pass through, then after conversion through the lens the light intensity distribution is obtained by the reflection on the coordinates of the output plane

$$I(x_2,y_2;\lambda)=A^2(\lambda)J_n^2\left[\frac{\pi a}{\lambda}D(x_2,y_2)\right] \tag{1}$$

Formula (1) makes clear that for a specific wavelength λ, the light intensity output of the system is a nonlinear function of the original image density, related to the square of the n order's Bessel function. Changing the positioning of the wave filter above the frequency spectrum surface can obtain outputs for differing orders. When the light source is an expanded partially coherent light source, as long as the light source's linearity does not cause confusion of the frequency spectra of the different orders, results similar to those of formula (1) can be obtained from partially coherent light image-formation theory.[3]

According to the theory of special functions, the position of the peak values of each exponent's Bessel function follows the direction of increases of the orders and the independent variables. Therefore, choosing differing diffraction orders can cause the output light intensity peak values to fall in differing density regions or realize density separation; each diffraction order corresponds to a certain density pass band. At the same time it filters out a few specific diffraction orders and causes their differing corresponding wavelengths to form an image combining pseudocolors for the regions of differing density. If the 0, 1 and 2 orders are taken and a narrow-band filter color strip with a pass-through rate of T_n is used to cause the central wavelength passed through of each order to separate as λ_0, λ_1 and λ_2; from formula (1), the output light intensity of the system can be obtained.

$$I(x_2,y_2)=\sum_{n=0}^{2}A^2(\lambda_n)T_nJ_n^2\left[\frac{\pi a}{\lambda_n}D(x_2,y_2)\right] \tag{2}$$

Figure 1 gives the light intensity I_n curves following the changes in density D when λ_0 = 650nm, λ_1 = 460nm, λ_2 = 520nm; for balance each curve is normalized according to its greatest value in the figure. Each colored light's incoherent overlay forms a pseudocolor image of colors continually changing to follow densities. From Figure 1 it can be seen that for a given order, although the changes of light intensity in the vicinity of peak output light intensity values are small, nonetheless these positions correspond to portions of rapid light intensity change in another order, thereby guaranteeing this encoding method possesses a high sensitivity, and that it is rather uniform within a definite range.

III. Experiments

Using projection or close-contact methods we modulated the images awaiting preparation onto holographic dry plates, with a grating frequency of 500 lines per inch. Suitably controlling the exposure interval, after developing, fixing and bleaching, we made phase modulated photos and put those into the

Figure 1. Theoretical Curve of Normalized Output Light Intensity I_n Following Changes in Density D

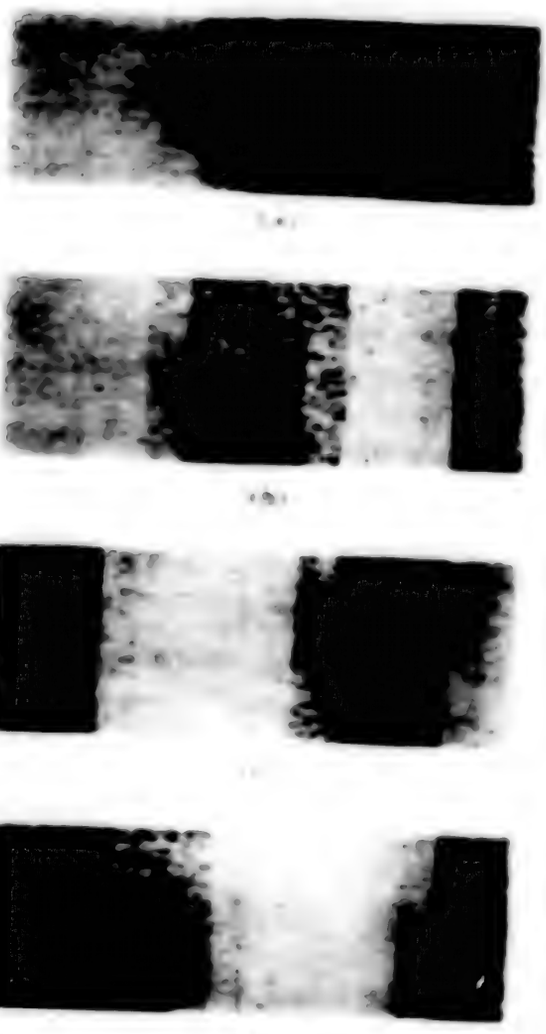

Figure 2. (a) Gray-scale Modulated Image
(b) 0 Order Wave-filter Output
(c) 1 Order Output
(d) 2 Order Output

of system's input scenes and then could carry out wave filtering operations. The system used a 12V 100W tungsten-iodide lamp as a light source, the Fourier transform lens' focal length f = 500mm.

To verify the theory of formula (2), Figures 2(a) (d) gave out modulated images of gray scale pictures and gave out wave-filtered output images with orders 0, 1 and 2 when illuminated with red light with a principal wavelength of 630nm after bleach processing. From the figures it is obvious that the peak output light intensity values moved in the direction of the increases in density, fitting the theory. Using red, blue and green primary color filters with principal wavelengths at 630nm, 440nm and 530nm to separately filter the three diffraction orders 0, 1 and 2, and using a small polarizing plate to control the color filter plates' transmissivity, and using a line polarized light to illuminate the whole system, we obtained results on the pseudocolor encoding of the gray scale pictures mentioned above (because of printing limitations, the picture is omitted). The gray scale variations in neighboring regions of Figure 3(a) can all be distinguished as color variations, so it can be seen that this method possesses high sensitivity. We have used this method to process a satellite remote sensing image of Wenglin Lake in northern Zhejiang Province, and obtained its pseudocolor encoded image. The rich colors in the picture provided much information hard to obtain from the black-and-white image, so the results are obvious (picture omitted). The experiments prove this is a practical method of pseudocolor encoding the densities of black-and-white images, which can be used in pseudocolor enhancement processing of black-and-white images from remote sensing, biology and medicine and other fields.

We would especially like to thank Comrade Wang Baolong (1769 1405 7893) and Yang Hui (2799 1979) for their various forms of assistance in the experimental work.

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13044
CSO: 4008/1080

APPLIED SCIENCES

ON THE UNIX OPERATING SYSTEM

Successfully Transported

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 12, 23 Jun 85 p 1

[Anonymous: "Success in Transporting the UNIX Operating System to a Chinese-Made Machine"]

[Text] This newspaper: Under the joint effort of Institute 710 of the Ministry of Aeronautics Industry, Harbin Polytechnical University and the Lishan Microelectronics Industry Corporation, the UNIX operating system has been successfully transported to the Chinese-made LS-84 machine (similar to Zilog, Incorporated 16-bit S8000/21 microcomputer) for the first time in China. The UNIX-C system after transporting is completely compatible with that of the original UNIX system.

The UNIX system is one of the advanced operating systems abroad. Its successful transport proves that this is an economical and effective way to bring in advanced technology.

The transported UNIX operating system is a part of the LS-84 machine software engineering, which includes the 7th edition and the C-compiler from the PDP-11 (including the nucleus and outer software) transported onto the Chinese-made LS-84 microcomputer. Also, the system analysis enhances the ROM software and diagnostic program of the S8000 machine. This engineering work was completed and passed ministry and departmental appraisals on 31 May in Beijing.

Surpasses Prolog

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 14, 23 Jul 85 p 1

[Article by Wang Lin [3769 2651]: "The Chinese Academy of Sciences Succeeded in [illegible]oping a Highly Efficient Prolog System"]

[Text] The C-Prolog system is developed by Laboratory No 2 of the Computing Institute, CAS by means of the Dual 68000 machine. With regard to speed and functions, this system surpasses the Prolog systems of the popular microcomputer abroad. It reaches an average speed of 500 LIPS, consists of more than 100 built-in predicates, can be run on any UNIX operating system, and is very easy to be transplanted onto other machines equipped with the C-language.

The scope of usage can be expressed by many modes such as built-in predicate document management, I/O, mathematical operations, list processing, information processing, etc. It not only has fast execution speed, it occupies very little internal memory, it also has the functions of trace and system call. It can also perform document editing as long as the system remains in the Prolog operating mode. Program debug and development are convenient. It is a good development tool for special-purpose systems, relational databases, natural language understanding and machine translation, information retrieval, office automation, etc.

At present, this institute has already distributed the object code and users' manual to most of the C-Prolog users. The institute together with related units have also begun to develop large-scale software systems via this system.

CSO: 4008/1004

JPRS-CST-85-037
29 October 1985

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TITLE: "Development of Catalyst B-198 for Oxidative Dehydrogenation of Butene into Butadiene in Fluidized-Bed Pilot Reactor"

SOURCE: Lanzhou HECHENG XIANGJIAO GONGYE [SYNTHETIC RUBBER INDUSTRY] in Chinese Vol 8 No 4, Jul 85 pp 229-237

TEXT OF ENGLISH ABSTRACT: An investigation was carried out on catalyst B-198 for oxidative dehydrogenation of butene into butadiene in a fluidized-bed reactor that was 800 mm in diameter and 12,610 mm long. The scale-up factor of the laboratory apparatus to the pilot reactor was approximately 6000. The results showed that, when the reactor was operated at temperatures of 365-375°C, space velocity of butene of 260-340 hr^{-1}, oxygen to butene molar ratio of 0.65-0.75, steam to butene molar ratio of 8.5-11, reactor inlet pressure of 0.35-1.0 kg/cm^2, and butylene content in butene feed of 75-95 mol percent, the following results were obtained: butadiene yield 60-63 mol percent, butadiene selectivity 90-91 mol percent, oxygen-containing by-products 0.4 mol percent, and vinylacetylene 0.008 mol percent, with no organic acids formed. These results were identical to the laboratory experimental data. This catalyst was also tested in commercial operations for 1000 hours. The scale-up factor of pilot plant to commercial operation was approximately 15, and the commercial operation results also verified the pilot plant data.

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TITLE: "Study of Ferrite Catalyst B-02 for Oxidative Dehydrogenation of Butene into Butadiene in Fixed-Bed Adiabatic Reactor"

SOURCE: Lanzhou HECHENG XIANGJIAO GONGYE [SYNTHETIC RUBBER INDUSTRY] in Chinese Vol 8 No 4, Jul 85 pp 238-240

TEXT OF ENGLISH ABSTRACT: The ferrite catalyst B-02 for oxidative dehydrogenation of butene into butadiene was investigated in a fixed-bed reactor, resulting in butadiene yield per pass of more than 60 percent, butadiene selectivity of more than 92 percent, and yield of organic oxygen-containing compounds of less than 1 percent, as well as greatly reduced environmental pollutants. This catalyst can be adapted to a wide range of process conditions, and when the molar ratios of oxygen to butene and steam to butene vary from 0.5 to 0.8 and from 8 to 10, respectively, satisfactory reaction results can be obtained.

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TITLE: "A Study of Mathematical Model of Micromixing for Polymerization Reactors (I)"

SOURCE: Lanzhou HECHENG XIANGJIAO GONGYE [SYNTHETIC RUBBER INDUSTRY] in Chinese Vol 8 No 4, Jul 85 pp 240-245

TEXT OF ENGLISH ABSTRACT: Based on the Danckwerts-Zwietering micromixing theory, a mathematical model of micromixing has been developed for polymerization reactors. When the kinetics of polymerization and the residence time distribution in the real reactor are known, the yield, average molecular weights and molecular weight distribution of the polymer produced under the two extreme conditions of micromixing that limit the behaviors of reactors can be calculated. This principle of modeling can be adapted to other reactors.

9717
CSO: 4009/1127

Computer Developments and Applications

AUTHOR: WANG Shili [3769 1395 3810]

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TITLE: "Structure and Implementation of Control Program for Large Extruding Machines"

SOURCE: Beijing DIANZI JISHU YINGYONG [APPLICATION OF ELECTRONIC TECHNIQUE] in Chinese No 3, 25 May 85 pp 2-5

ABSTRACT: Extruding machines presently produced in China still employ the relay logic control system, which causes inaccuracies in the extrusion rate, thereby adversely affecting the output and quality of domestically manufactured extruding machines. To remedy such a situation, the Shanghai City Electrical Automation Institute has developed a microcomputer control device and applied it on the domestically manufactured, large-size 4,000-gram extruding machines. The device adopts the Z-80 single-board computer and employs its peripheral equipment to monitor the production process. The various operations of the energy-saving machine are completed by the hydraulic system under the control of the microcomputer's automatic-control device.

AUTHOR: DAI Peishan [2071 1014 0810]

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TITLE: "Single-board Computer Used for Monitoring and Controlling Transfusion Disinfection Under High Pressure"

SOURCE: Beijing DIANZI JISHU YINGYONG [APPLICATION OF ELECTRONIC TECHNIQUE] in Chinese No 3, 25 Mar 85 p 6-10

ABSTRACT: In China, transfusion disinfection of fluid, such as glucose injection fluid, is still generally relied on by the operator to watch the temperature gauges and steam pressure meters and manually regulate the amount of steam entering the tank in order to control the disinfection temperature and steam pressure. This is inconvenient and makes it difficult to control the temperature and time accurately. This article describes the high-pressure transfusion disinfection controlling system primarily based on the TP801 single-board microcomputer. It has been employed to monitor and control the entire glucose injection fluid disinfection process on the YXQ-WF32 high-pressure steam disinfection tank at the Guilin Pharmaceutical Plant No 2.

AUTHOR: SHAN Guangzhi [0830 1639 2535]

ORG: Tianjin Radio Plant No 1

TITLE: "How To Realize Computer-aided Debugging"

SOURCE: Beijing DIANZI JISHU YINGYONG [APPLICATION OF ELECTRONIC TECHNIQUE] in Chinese No 3, 25 May pp 14-16, 42

ABSTRACT: The introduction of a digital voltage meter into a microprocessor not only lowers the requirements of the components and reduces the difficulties in production and debugging but also "opens the door" for computer-aided debugging. A voltage meter equipped with a microprocessor generally has an interface circuit between the internal microprocessor and analog sections. Utilizing these ready-made interface circuits makes it possible to bring the entire debugging process in the analog section under the control of the computer. The HG-1850 produced by the Tianjin Radio Plant No 1 employs the TRS-80 computer system. Through the form of man-machine communication, it achieves computer-aided debugging in the analog section. On the basis of the block diagram of the HG-1850 microprocessor voltage meter's analog section, this article presents the general debugging flow chart, and using the interface circuit and reference supply circuit as examples, it explains how to realize computer-aided debugging.

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ORG: Shanghai Radio Plant No 3

TITLE: "Control Communication Receivers With Microprocessors"

SOURCE: Beijing DIANZI JISHU YINGYONG [APPLICATION OF ELECTRONIC TECHNIQUE] in Chinese No 3, 25 Mar 85 pp 23-24, 34

ABSTRACT: The article begins by stressing the importance of installing microprocessors in order to improve the performance of communications equipment. It lists nine necessary functions of microcomputers in the communications receiver, describes the composition of the computer system and explains the proper design of software.

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29 October 1985

AUTHOR: TAN Dongqiang [2995 2639 0973]
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TITLE: "Microcomputers Used in Simulating the Biological Systems"

SOURCE: Shenyang XIAOXING WEIXING JISUANJI XITONG [MINI-MICRO SYSTEMS] in Chinese No 12, Dec 84 pp 49-52

ABSTRACT: This article describes a method of employing microcomputers to simulate biological systems. It is based on the modern network theory, modern cybernetics and computer science and employs microcomputers as tools for making analyses and conducting simulations. It has a definite significance in gaining an in-depth understanding of and in studying biological systems.

12949
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AUTHOR: CUO Fushun [6753 4395 7311]
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ORG: Harbin University

TITLE: " A Real-time Operating System for the HIT Z8000 Microcomputer"

SOURCE: Shenyang XIAOXING WEIXING JISUANJI XITONG [MINI-MICRO SYSTEMS] in Chinese No 3, 8 Mar 85 pp 71-18

ABSTRACT: Most of the 16-bit microcomputers of all types are equipped with time-sharing operating systems with fairly complete functions. They are unsuitable for use in a real-time control environment. The main reasons are: (1) that it has low-efficiency and poor real time and (2) that under the condition in which there is no source program in the operating system, it is very difficult to add peripheral equipment. Some of the systems provide the means for working out a drive program for externally added equipment, such as a System 8000, but it pays the price for lowering the system's performance. In order to meet the need for real-time control Harbin University developed the GJZ operating system on the imported 16-bit HIT-Z8000 microcomputer. It is a single-track, multipurpose real-time system and has such features as articulate structure, simple functions, strong real time and high reliability. This article discusses some of the considerations concerning the design, functions, structure, technical implementation and practical applications of the GJZ system.

12949
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AUTHOR: TANG Mingdao [0781 2494 6670]

ORG: State-operated Plant No 871 in Qin'an, Gansu

TITLE: "ECL High-speed Comparators"

SOURCE: Beijing DIANZI JISHU YINGYONG [APPLICATION OF ELECTRONIC TECHNIQUE] in Chinese No 4, 25 Apr 85 pp 34-36, 48

ABSTRACT: This article introduces two kinds of comparators--E1650/E1651 and J685--produced by the state-owned Tianguang Electrical Plant. The performance of these comparators is identical with MC1650/C1651 of the Motorola Company and AM685 of the AMD Company of the United States. The tubes are arranged similarly and are interchangeable. These two types of components can operate above 200 MH_z; conversion is fast, and they are ideal high-speed A/D comparators. In particular, the J685 has a high gain and strong resolution capacity. It is also an ideal amplifying and interface circuit.

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TITLE: "Input Protection Problem of Computing Amplifier"

SOURCE: Beijing DIANZI JISHU YINGYONG [APPLICATION OF ELECTRONIC TECHNIQUE] in Chinese No 4, 25 Apr 85 pp 37-39

ABSTRACT: People are generally familiar with the diode protection clamper used in an integrated computing amplifier input terminal, but such an added circuit is by no means "beneficial and harmless." In areas where protection is needed, it can certainly protect the normal operation of the computing amplifier. However, its introduction can also cause the accompanying maladjustment and drift and can adversely affect the precision of the circuit. The problems of when and what kind of input protection should be set up are explained in the article.

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TITLE: "High-precision Voltage Reference Power Supply"

SOURCE: Beijing DIANZI JISHU YINGYONG [APPLICATION OF ELECTRONIC TECHNIQUE] in Chinese No 4, 25 Apr 85 pp 40-41, 17

ABSTRACT: Precision voltage reference is a new-type general-purpose semi-conductor integrated circuits. It has become an indispensible component among many analog and integrated circuits. As integrated circuit technology develops, the U.S. Analog Components Company has promoted the sale of a programmable multi-circuit output voltage reference power supply, AD584, which has strong power functions. As the use of a precision reference voltage supply becomes widespread, voltage reference power supply will become standardized integrated circuits used extensively on electronic equipment.

12969
CSO: 4009/1093

AUTHOR: Xi Dan [1598 0030]

ORG: None

TITLE: "Several Questions Concerning Quantitative Research on the Study of Information in China"

SOURCE: Harbin [illegible] [INFORMATION SCIENCE] in Chinese Vol 9, No 1, 15 Feb 91 pp 34-36, 44

ABSTRACT: This article reviews the direction taken by China in its quantitative research on information in recent years and analyzes current problems in the research program. The author is of the opinion that the most important question lies in the lack of a unified research base with no unambiguous objective, and many major topics were not touched upon. Most of the research topics were confined to the translation and evaluation of results already achieved abroad. With a thorough understanding of the subject, the author probes into the necessity and feasibility of quantitative research. On this basis, the writer concludes that the theoretical foundation of quantitative research on the study of information lies in information theory and fuzzy mathematics.

AUTHOR: MAO Hongquan [3029 3163 0356]

ORG: Scientific Information Institute of Jiangxi Province

TITLE: "A View of Local Scientific Technical Information Service in China"

SOURCE: Harbin Qingbao KEXUE [INFORMATION SCIENCE] in Chinese Vol 4, No 3, 15 Sep 85 pp 37-39

ABSTRACT: How to develop consultative service effectively has now become an important question in the new situation of launching scientific-technical information work. The writer has conducted investigations into such questions as the scope, tasks and methods of launching comprehensive scientific-technical consultative service. He is of the opinion that there still exist in the country's present information work such serious problems as low efficiency and the situation in which people "share food from the same big pot" regardless of whether the workers do good or shoddy work. He calls for reforms in the contents, scope, method and management in the information work program.

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24 October 1991

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TITLE: "Characteristic of Hydrogen Embrittlement (HE) in 0Cr13Ni4Mo Steel and Estimate of the Safety of Cast Giant Vane of Hydraulic Turbine for HE"

SOURCE: Shenyang ZHUZAO [FOUNDRY] in Chinese No 4, 1985 pp 1-8

TEXT OF ENGLISH ABSTRACT: Tensile tests and hydrogen delayed cracking tests in both cast and forged specimens of 0Cr13Ni4Mo steel with cathodic charged hydrogen have been carried out. The results show that the HE of 0Cr13Ni4Mo steel is reversible, and the stress intensity threshold K_{IH} is linear with the logarithmic hydrogen concentration Co. As the amount of hydrogen increases, the mode of fracture is changed from dimple to quasi-cleavage and to intergranular fracture. When the amount of hydrogen is less than 10 ppm, the sensibility to hydrogen delayed cracking in casting is better than that in forging. This paper has also estimated the safety of cast vane of 12500KW hydraulic turbine.

12569
CSO: 4009/3

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et al.

ORG: Nei Monggol Institute of Metallic Materials

TITLE: "Carbonitride in Gas Carbonitriding Layer on 18CrMnNiMoA Steel"

SOURCE: Beijing ACTA METALLURGICA SINICA [JINSHU XUEBAO] in Chinese Vol 21, No 4, 18 Aug 85 pp 273-280

TEXT OF ENGLISH ABSTRACT: The properties of gas carbonitriding layer on 18CrMnNiMoA steel relating to its morphology, structure, composition, distribution and partition of alloying elements among the phases contained have been studied by means of electrolytic extraction-chemical separation-X-ray diffraction phase analysis layer by layer, as well as by TEM or electron diffraction observation and by chemical analysis. The strengthening mechanism of the carbonitriding layer has also been discussed.

AUTHOR: DAI Wenmin [2071 0795 3046]

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TITLE: "Magnetic Properties of Type II Superconductors At Low Temperature"

SOURCE: Beijing ACTA METALLURGICA SINICA [JINSHU XUEBAO] in Chinese Vol 21, No 4, 18 Aug 85 pp 305-310

TEXT OF ENGLISH ABSTRACT:

The penetration depth $\lambda(T)$, coherent length $\xi(T)$, high critical field $H_{c2}(T)$ and coefficients $\epsilon_1(T)$ and $\epsilon_2(T)$ of the type II superconductors at low temperature were calculated by the generalized G-L equations. An expression of the structure of a vortex line at low temperature was derived. The lower critical field $H_{c1}(T)$ was evaluated by some simplified assumptions. The effect of the impurities on λ, ξ, ϵ_1, ϵ_2 and H_{c2} was also discussed. After the calculation, it shows that the Werthamer's and Wang's equations are no longer valid while the applied field H_e approaches to $H_{c2}(T)$ at low temperature.

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ORG: Institute of Metal Research, CAS, Shenyang

TITLE: "Crack Nucleation and Propagation in Hydrogenated Polycrystalline β-Ti"

SOURCE: Beijing ACTA METALLURGICA SINICA [JINSHU XUEBAO] in Chinese Vol 21, No 4, 18 Aug 85 pp 323-328

TEXT OF ENGLISH ABSTRACT: The hydrogenated polycrystalline β-Ti was observed under SEM to obtain a better understanding of its tensile fracture microprocess, principally, of the correlation of contents between overall H_2 and hydride, of the effect of hydride on crack nucleation and propagation, as well as of the behavior of the deformation and fracture microprocess caused by hydride. It was found that: (1) The crack nucleation in the polycrystalline β-Ti with H_2 content less than 152 ppm is irrelevant to the hydride. It is ductile cracking and conforms to the slip mechanism. While its H_2 content more than 727 ppm, it is brittle cracking, controlled by the hydride and belongs to the nonslip mechanism; (2) In β-Ti with lower H_2 content, the transgranular crack propagation along a zigzag path forward is controlled by maximum shear stress. On the contrary, in β-Ti with higher H_2 content, the crack is still intergranularly propagated along a zigzag path forward, yet its ductile feature is lost.

AUTHOR: FENG Benzheng [7458 2609 2398]
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TITLE: "Temperature Dependence of Electrical Resistivity of Some Amorphous Alloys"

SOURCE: Beijing ACTA METALLURGICA SINICA [JINSHU XUEBAO] in Chinese Vol 21, No 4, 18 Aug 85 pp B189-B198

TEXT OF ENGLISH ABSTRACT:

Measurements of the electrical resistivity, its temperature dependence and the transition temperature at different stages of some amorphous alloys, such as $Zr_{100-x}M_x$ (M = Fe, Co, Ni, Cu or Pd), $Cu_{100-x}Ti_x$, $Pd_{80-x}Si_{20}M_x$ (M = Cu, Ag, Ni, Pt, Rh, Ru, Ir, Os, Hf, Ta, W or Re) and $Pd_{80-x}Si_{20}Cr_x$, prepared by the melt-quenching technique were made in the temperature range of 0—300°C. The effects of minor additives on them are also discussed.

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SHEN Baogen [3088 0202 2704]
ZHAO Jiangao [6392 6015 7559]
et al.

ORG: Institute of Physics, CAS, Beijing

TITLE: "Effect of Cr, Mo or W Addition on Magnetic Properties of Amorphous Fe-B Alloys"

SOURCE: Beijing ACTA METALLURGICA SINICA [JINSHU XUEBAO] in Chinese Vol 21, No 4, 18 Aug 85 pp B199-B206

TEXT OF ENGLISH ABSTRACT: Experimental results for atomic magnetic moment, Curie temperature, Tc, and coefficient B of the $T^{3/2}$ term in the Bloch law for amorphous alloys Fe-M-B (M=Cr, Mo or W) prepared by the drum spinning technique are reported. The average magnetic moment for each metal atom is 2.0, -3.96, -4.62 or -4.08 μ_B for Fe, Cr, Mo or W respectively in the three amorphous alloy systems. The decrease of Tc is at the rate of 20.5K/at.-% Cr, 27.7K/at.-% Mo, or 26K/at.-% W with increasing Cr, Mo or W content respectively. These results are discussed in the light of a "mixed" model due to C. W. Chen. The effect of the magnetic short range order around Tc is clearly observed by applying an external magnetic field. The coefficient B increases with the concentration of Cr, Mo or W, which is interpreted as a consequence of weakening of exchange coupling between the magnetic atoms.

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TITLE: "Electrical Properties and Crystallization of $Cu_{0.60}Ti_{0.40}$ Metallic Glass"

SOURCE: Beijing ACTA METALLURGICA SINICA [JINSHU XUEBAO] in Chinese Vol 21, No 4, 18 Aug 85 pp B214-B221

TEXT OF ENGLISH ABSTRACT: The electrical properties and crystallization of $Cu_{0.60}Ti_{0.40}$ metallic glass were studied by X-ray diffraction, DSC technique and electrical resistance measurement under isothermal and isochronal heating conditions. A negative temperature coefficient of electrical resistivity of the metallic glass $Cu_{0.60}Ti_{0.40}$ is presented, and it becomes positive and increases in value in the process of crystallization. Its crystallization is shown in two stages and in basic conformity with the J-M-A equation. A good mutual conformant about the activation energies of crystallization was made with calculation by various methods. It seems that there is a great potentiality in the increase of the stability of Cu-Ti metallic glass.

12949
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29 October 1985

AUTHOR: WU Junpeng [0702 0689 2590]

ORG: Shanghai Jiaotong University

TITLE: "Theoretical Analysis of the Effect of Dilute Solution of High Molecular Weight Polymers on Cavitation Noise"

SOURCE: Shanghai ZHONGGUO ZAOCHUAN [SHIPBUILDING OF CHINA] in Chinese No 90, Jul 85 pp 15-26

TEXT OF ENGLISH ABSTRACT: This paper briefly describes the experimental results of propeller cavitation noise in uniform dilute solution of polymers. The motion equation of spherical bubble is derived by means of Oldroyed's constitutive equation which is applied to uniform dilute solution of polymers. The dimentionless parameters controlling noise radiation of spherical bubbles in the solution of polymers are obtained. These parameters are (1) bubble Reynolds number Re, (2) elastic parameter of solution T^{*}, and (3) concentration parameter of solution $c\cdot[\eta]$. The effect of these parameters on noise radiation of spherical bubble is qualitatively discussed as well. The experimental results of propeller cavitation noise are explained by this spherical bubble theory. Limitation of this theory and further research proposals for this subject are also discussed.

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